

WHAT IS CLAIMED IS:

1. A distance relay apparatus comprising:

a sampling element which samples an amount of  
electricity of a voltage and a current, which are  
5 received from an object to be protected, at regular  
intervals;

an A/D converting element which converts the  
amount of electricity sampled by the sampling element  
into digital data;

10 a first directional relay element which receives  
the digital data obtained by the A/D converting element  
to perform computation to detect a fault, which occurs  
in the forward direction from an installing point of  
the relay apparatus, based on a computing equation;

15 a zone-1 distance relay element which receives the  
digital data to perform computation to detect a fault  
within a predetermined zone viewed from the installing  
point of the relay apparatus, based on a computing  
equation;

20 a fault detecting relay element which receives the  
digital data to perform computation to detect a fault  
within a zone that is narrower than that of the zone-1  
distance relay element in terms of data time length  
which is shorter than that used for the computation of  
25 the zone-1 distance relay element; and

a logic element which outputs a relay signal in  
accordance with a detecting operation of at least one

of the zone-1 distance relay element and the fault detecting relay element and a detecting operation of the first directional relay element.

2. The distance relay apparatus according to claim 1, wherein the first directional relay element, the zone-1 distance relay element and the fault detecting relay element receive the digital data, which is filtered by digital filters, and perform computation to detect a fault, and time required for filtering the digital data in the digital filter connected to the fault detecting relay element is shorter than time required for filtering the digital data in the digital filter connected to the first directional relay element and the zone-1 distance relay element.

3. The distance relay apparatus according to claim 1, wherein the first directional relay element, the zone-1 distance relay element and the fault detecting relay element receive the digital data, which is filtered by digital filters, and perform computation to detect a fault, and the data time length used for the computation in the fault detecting relay element is shorter than the data time length used for the computation in the first directional relay element and the zone-1 distance relay element.

4. The distance relay apparatus according to claim 1, further comprising a second directional relay element having a setting value that is larger than that

of the first directional relay element, and

wherein the logic element outputs the relay signal  
in one of a case where both the second directional  
relay element and the fault detecting relay element are  
5 operated and a case where both the first directional  
relay element and the zone-1 distance relay element are  
operated.

5. The distance relay apparatus according to  
claim 2, further comprising a second directional relay  
10 element having a setting value that is larger than that  
of the first directional relay element, and

wherein the logic element outputs the relay signal  
in one of a case where both the second directional  
relay element and the fault detecting relay element are  
15 operated and a case where both the first directional  
relay element and the zone-1 distance relay element are  
operated.

6. The distance relay apparatus according to  
claim 3, further comprising a second directional relay  
20 element having a setting value that is larger than that  
of the first directional relay element, and

wherein the logic element outputs the relay signal  
in one of a case where both the second directional  
relay element and the fault detecting relay element are  
25 operated and a case where both the first directional  
relay element and the zone-1 distance relay element are  
operated.

7. The distance relay apparatus according to claim 1, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

8. The distance relay apparatus according to claim 2, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

9. The distance relay apparatus according to claim 3, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

10. The distance relay apparatus according to claim 4, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

11. The distance relay apparatus according to claim 1, wherein the fault detecting relay element includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

12. The distance relay apparatus according to claim 2, wherein the fault detecting relay element

includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

13. The distance relay apparatus according to  
5 claim 3, wherein the fault detecting relay element includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

14. The distance relay apparatus according to  
10 claim 4, wherein the fault detecting relay element includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

15. The distance relay apparatus according to  
15 claim 1, wherein the fault detecting relay element includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

16. The distance relay apparatus according to  
20 claim 2, wherein the fault detecting relay element includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

17. The distance relay apparatus according to  
25 claim 3, wherein the fault detecting relay element includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

18. The distance relay apparatus according to  
claim 4, wherein the fault detecting relay element

includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

19. The distance relay apparatus according to claim 1, wherein the fault detecting relay element  
5 includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

20. The distance relay apparatus according to claim 2, wherein the fault detecting relay element  
10 includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

21. The distance relay apparatus according to claim 3, wherein the fault detecting relay element  
includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

15 22. The distance relay apparatus according to claim 4, wherein the fault detecting relay element includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

20 23. The distance relay apparatus according to claim 1, wherein the fault detecting relay element includes an impedance relay which obtains an impedance from the voltage and the current by computation and detects that the impedance becomes not higher than a predetermined level.

25 24. The distance relay apparatus according to claim 2, wherein the fault detecting relay element includes an impedance relay which obtains an impedance

from the voltage and the current by computation and detects that the impedance becomes not higher than a predetermined level.

5        25. The distance relay apparatus according to claim 3, wherein the fault detecting relay element includes an impedance relay which obtains an impedance from the voltage and the current by computation and detects that the impedance becomes not higher than a predetermined level.

10        26. The distance relay apparatus according to claim 4, wherein the fault detecting relay element includes an impedance relay which obtains an impedance from the voltage and the current by computation and detects that the impedance becomes not higher than  
15        a predetermined level.